Administrator's Column

(In this column, NASA Activities features an article by NASA Administrator James Beggs. These articles focus on subjects chosen by him that address topics of broad interest to the agency's employees. The column this month features an address presented to the California Museum of Science and Industry dinner, Los Angeles, California.)

Note: *The speech appearing in the Administrator's Column (October issue) was delivered at NASA's Ames Research Center, not at Town Hall of California.*

The Rate Of Change

Some 2500 years ago, the Greek philosopher, Heraclitus, taught that there is no permanent reality except the reality of change. As he put it, "You cannot step twice into the same river."

In Heraclitus' day, the river of change was a slowly meandering stream. Today, it is a torrent. The rate of change is accelerating so rapidly that unless we can find some way to keep our sights on tomorrow, we cannot expect to be in touch with today.

Indeed, understanding this acceleration and adapting to it has become one of the consuming challenges of the modern age. It is a challenge of enormous magnitude. Sir George Thomson, the British physicist and Nobel laureate, believed the nearest historic parallel was the invention of agriculture in the Neolithic Age. Other authorities find that the effects of the technological revolution we are experiencing will be deeper than any social change we have ever undergone.

The rapid pace of scientific and technological change has become so much a part of our lives that we tend to take it for granted. Change has entered our lives so quickly and so quietly that marvels of science themselves have made science seem less marvelous. And as humanity's capacity for awe diminishes, humanity, too, could be diminished.

We can't afford to let this happen. For, if we lose our sense of wonder at what we have achieved, we are in danger of quenching the spark within that motivates us to continue to ascend to new plateaus of knowledge and accomplishment.

Every so often we need to remind ourselves that science and technology have moved us further faster than in any period in human history.

Time was, for example, that we gazed at the stars and wondered at their eternal mysteries. Today we are probing the heavens and slowly, but surely, the stars are yielding their secrets. Indeed, we have found that some may even have solar systems in varying stages of formation. For the first time, we have walked on another heavenly body. And we have sent automated extensions of human intelligence into the solar system and beyond, billions of miles from our own planet from which they evolved so suddenly.

Today, we look back at the Wright Brothers' first, faltering flight at Kitty Hawk and recognize that its entire distance was no greater than the wing span of a 747 transport. In just 78 years, a human lifespan, we soared from the dunes of Kitty Hawk to the routine access to space we enjoy today with the Shuttle, in which we orbit the Earth every 90 minutes at close to 18,000 miles an hour.

We have come a long way, indeed. And our pace is accelerating.

When recorded human history began around 6,000 B.C., the fastest transportation over long distances was the camel caravan, which moved at eight miles an hour.

It took 4,400 years for the chariot to raise man's speed to 20 miles an hour and 3,400 more years before second generation steam locomotives surpassed that speed. In 1880, an advanced locomotive managed to attain a speed of 100 miles an hour.

But by mid-1950s turboprop airplanes had quadrupled that figure and two decades later, jet aircraft had far surpassed it. During the 1960s, men in space capsules orbited the Earth at close to 18,000 miles an hour and, in the late 1960s and early 1970s, traveled to the moon at nearly 25,000 miles an hour.

Some 50,000 years ago, the first creatures indistinguishable from modern men and women began to appear on Earth. If we were to divide modern man's existence on Earth into lifetimes of about 62 years each we begin to get a pretty dramatic idea of how the rate of change has accelerated.

There have been approximately 800 such lifetimes, about 650 of which were spent in caves or other primitive shelters.

Only during the last 70 lifetimes has writing made it possible to communicate effectively from one lifetime to another.

Only during the last six lifetimes have masses of people ever seen a written word.

Only during the last four lifetimes has it been possible to measure time with any precision.

Only within the last two lifetimes has anyone, anywhere, used an electric motor.

Only within the last two lifetimes, have we developed the overwhelming majority of material goods we use, and most of the means to combat age-old diseases.

And only within this most recent lifetime have we seen our understanding of the Earth, the solar system and the Universe mushroom at a fantastic rate. Indeed, within the past 26 years, we have learned more about ourselves and our place in the Universe than in any other period of history.

I am proud that NASA and our predecessor, the National Advisory Committee for Aeronautics have played a key role in promoting these changes and advancing our understanding of their implications in our century.

For more than 70 years, we have pushed forward the frontiers of science and technology on Earth, in the air and in space. In so doing, we have helped to advance American technological leadership and spurred our economy on to greater growth and progress, while bringing untold benefits to people everywhere.

Indeed, I often say the benefits of research and technology are hard to measure, but impossible to question. Tens of thousands of spin-offs and applications of aerospace research are bettering life for people everywhere. They range from programmable heart pacemakers and other implantable medical devices to new alloys, fire-fighting equipment and traffic control systems.

Robert H. Goddard, the father of American rocketry once said: "Real progress is not a leap in the dark, but a succession of logical steps."

And so it has been and will continue to be with our space program.

The manned space program evolved from sub-orbital and orbital flights in cramped capsules to the Shuttle, in which astronauts fly in shirt-sleeved comfort and return to Earth on aircraft runways.

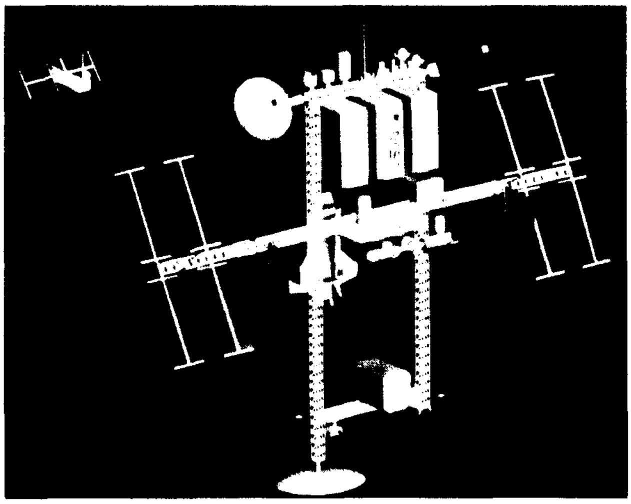
The early balloons and basketball-sized satellites have grown into sophisticated orbiting spacecraft that monitor weather, climate and Earth resources, assist navigation and, by pinpointing distress signals on Earth, help to save lives. By the same token, our early, scientific spacecraft have rapidly become more complex and are returning a rich harvest of imagery and data from the solar system, the galaxies and the Universe.

Our space program has taught us that just as there are no limits on our aspirations, so, too, can there be no limits on our reach, given the will and resources to cross new frontiers.

We are now flying the Shuttle once a month. By 1988, with our four-orbiter fleet, we expect to double that flight rate to 24 missions a year. Our schedule will take us over the 100-mission mark by 1989. And we believe we will maintain or better that flight rate through the end of the century.

By the mid-1990s, when our Space Station will be open for business, we will be living, working and learning in space on a permanent basis. The President has called the Space Station our next logical step in space. And, indeed, it is, because it will give us the chance to do things in science, in commerce, and in industrial research that we never dreamed possible at the dawn of the space age.

With the Space Station, we will be able to exploit three unique attributes of space; its magnificent vantage point for observing the Earth and the Universe; its microgravity environment and the pure vacuum created in the wake of spacecraft.



The "dual keel" concept of the Space Station.

These features offer unlimited opportunities for scientific and technological progress, not only for ourselves, but for our friends in Europe, Canada and Japan, with whom we expect to be partners in the Station's development and use.

For example, on the Space Station we could manufacture medicines that could enhance dramatically the treatment of such diseases as cancer and diabetes; grow pure crystals for electronics uses and make new alloys for a wide application of industrial use on Earth.

The Space Station will give us a permanent laboratory in orbit to investigate the effects of microgravity on the physical processes and on the human body. It will provide us with a permanent base for science in orbit, a magnificent vantage point to study the Earth, the solar system and the Universe.

A most important use for the Space Station will be to serve as a repair and maintanance facility for satellites, a service station if you will, to increase satellites' lifetimes and utility. Our dramatic satellite repair and rescue missions foreshadow, in a small way, the kind of operations that will become routine with the Space Station.

Finally, and perhaps, most important, the Space Station could be the springboard for other, more ambitious missions, a manned lunar base, or a manned journey to Mars or to the asteroids. It could serve as our way station to the stars.

Shakespeare wrote: "The time of life is short; to spend that shortness basely were too long."

The time of life is indeed, short. And we have learned in this century that to bring our dreams alive we must work fast and we must give it all we've got. Because only then can we keep in touch with today and meet tomorrow with confidence.

Our high adventure in space is a challenge that goes to the heart of one of the noblest of human aspirations: the pursuit of knowledge toward the purpose of peace and human benefit.

More than half of century ago, Albert Einstein made a speech at the California Institute of Technology which summed up that challenge more eloquently than I ever could. He said: "It is not enough that you should understand about applied science in order that your work may increase man's blessings. Concern for man himself and his fate must always form the chief interest of all technical endeavors . . . in order that the creations of our mind shall be a blessing and not a curse to mankind."

Einstein's advice is even more important today, in this fast moving, ever-changing and increasingly complex world. And I believe that as free men and women, each of us, in our own way, has an obligation to be guided by it, in thought as well as action.

The wonders of scientific discovery, the benefits of new technology and the joy of pushing forward the knowledge frontier, all are the fruits of freedom. Those fruits are sweet, indeed. They help to keep the American Dream alive, here at home and thoughout the world.

Keeping that dream alive, nourishing what Abraham Lincoln called "humanity's last best hope on earth", is the greatest gift we can give our children and future generations.

Our young people are the trustees of the American Dream. They will both shape and inherit the future. If we can continue to feed their insatiable hunger for knowledge and continue to motivate them to expand their horizons, we will have given them and our country a priceless gift indeed.

Educational Plans For Shuttle Mission 51-L Announced

Live lessons to classrooms around the country and scientific demonstrations filmed for use in educational products are just some of the activities that will be involved with Shuttle Mission 51-L and the flight of the first Space Flight Participant.

Christa McAuliffe, the finalist in the NASA Teacher in Space Project, along with Barbara Morgan, the back-up candidate, reported to NASA's Johnson Space Center, Houston, on Sept. 9 to begin training which will continue until the flight of 51-L now set for launch no earlier than Jan. 22, 1986.

NASA is making plans for a direct satellite broadcast and schools will be able to observe lessons from space.

The first live lesson entitled "The Ultimate Field Trip" will allow students to compare daily life on the Shuttle with that on Earth. McAuliffe will take viewers on a tour of the Shuttle, explaining crewmembers' roles, showing the location of computers and controls and explaining experiments being conducted on the mission. She also will demonstrate how daily life in space is different from that on Earth in the preparation of food, movement, exercise, personal hygiene, sleep and the use of leisure time.

The second lesson called "Where We've Been, Where We're Going" will help the audience understand why people use and explore space by demonstrating the advantages of manufacturing in the micro-gravity environment, highlighting technological advances that evolve from the space program and projecting the future of humans in space.

Also during the 51-L mission, McAuliffe will be involved in several activities which will be filmed and later used in educational products. Potential activities include:

- **Earth Magnetism**—Photograph and observe the lines of magnetic force in three dimensions in a microgravity environment.
- **Newton's Law**—Demonstrate Newton's first, second and third laws in microgravity.
- **Bubbles**—Understand why products may or may not effervesce in a microgravity environment.